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| 09/992,971      | 11/14/2001  | Koichi Tanaka        | 09792909-5272       | 6785             |

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EXAMINER

RUTHKOSKY, MARK

|          |              |
|----------|--------------|
| ART UNIT | PAPER NUMBER |
|----------|--------------|

1745

DATE MAILED: 08/15/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

**Application No.**

09/992,971

**Applicant(s)**

TANAKA, KOICHI

**Examiner**

Mark Ruthkosky

**Art Unit**

1745

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 13 June 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-28 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-28 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>6/13/2005</u> | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### *Claim Rejections - 35 USC § 102*

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 15-28 are rejected under 35 U.S.C. 102(b) as being anticipated by Kelley et al.

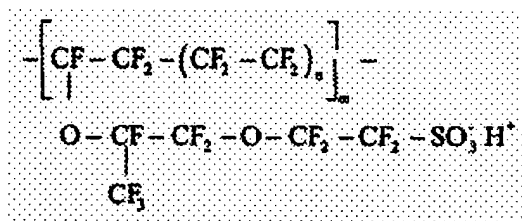
(US 6,080,501.)

The instant claims are to an electrochemical device comprising a fuel electrode which becomes a negative electrode while accompanying the generation of hydrogen; an oxygen electrode provided in contact with oxygen which becomes a positive electrode while accompanying generation of water from oxygen molecules, the hydrogen ions, and electrons; an ion-exchange membrane for conducting the hydrogen ions in the fuel electrode into the oxygen electrode, the ion-exchange membrane having a proton conductor comprising a polymer material; and a fuel source for supplying a fuel so as to generate the hydrogen ions in the fuel electrode; the fuel electrode and the fuel source constitute a fuel electrode assembly in a state being in contact with each other; the fuel electrode assembly is surrounded by the ion-exchange membrane in a state being in contact with the ion exchange membrane; and the ion-exchange

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membrane is surrounded by the oxygen electrode in a state being in contact with the oxygen electrode. The ion exchange membrane further comprises a carbon cluster derivative including a plurality of functional groups capable of transferring a plurality of protons between each of the functional groups of the carbon cluster derivative.

Kelley et al. (US 6,080,501) teaches an electrochemical device comprising a fuel electrode which becomes a negative electrode while accompanying the generation of hydrogen; an oxygen electrode provided in contact with oxygen which becomes a positive electrode while accompanying generation of water from oxygen molecules, the hydrogen ions, and electrons; an ion-exchange membrane for conducting the hydrogen ions in the fuel electrode into the oxygen electrode, the ion-exchange membrane having a proton conductor; and a fuel source for supplying a fuel so as to generate the hydrogen ions in the fuel electrode; wherein the fuel electrode and the fuel source constitute a fuel electrode assembly in a state being in contact with each other. The proton conductor is a solid polymer electrolyte material that is ion-permeable. The material includes a porous portion and inorganic, sulfur ionic groups attached to the membrane to transfer charge. The ion exchange membrane include polystyrene polymers substituted with perfluorinated sulfonic acid groups, inorganic polymers and Nafion (col. 3, lines 35-50.) These materials comprise a carbon cluster polymer derivative including a plurality of  $\text{SO}_3\text{H}$  groups that transfer protons between the functional groups of the carbon cluster derivative.

*Nafion*

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The fuel source includes metal hydride materials and carbon nanotubes (col. 4, lines 1-45.) The materials are contained in a housing and are electrically connected through the inter medium (col. 4, lines 30-60.) The housing has oxidant passages for electrode reactivity (figures.) With regard to claims 21 and 22, MPEP 2113 states, "Even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process." The material includes carbon chains in the membrane. Thus, the claims are anticipated.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

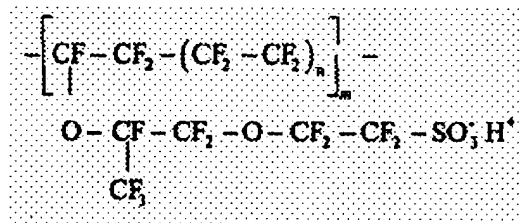
(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kelley et al. (US 6,080,501), and further in view of Bass et al. (US 6,001,500.)

Kelley et al. (US 6,080,501) teaches an electrochemical device comprising a fuel electrode which becomes a negative electrode while accompanying the generation of hydrogen; an oxygen electrode provided in contact with oxygen which becomes a positive electrode while accompanying generation of water from oxygen molecules, the hydrogen ions, and electrons; an ion-exchange membrane for conducting the hydrogen ions in the fuel electrode into the oxygen

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electrode, the ion-exchange membrane having a proton conductor; and a fuel source for supplying a fuel so as to generate the hydrogen ions in the fuel electrode; wherein the fuel electrode and the fuel source constitute a fuel electrode assembly in a state being in contact with each other. The proton conductor is a solid polymer electrolyte material that is ion-permeable. The material includes a porous portion and inorganic, sulfur ionic groups attached to the membrane to transfer charge. The ion exchange membrane is polystyrene polymers substituted with perfluorinated sulfonic acid groups, inorganic polymers and Nafion (col. 3, lines 35-50.) These materials comprise a carbon cluster polymer derivative including a plurality of SO<sub>3</sub>H groups that transfer protons between the functional groups of the carbon cluster derivative.



Nafion

The fuel source includes metal hydride materials and carbon nanotubes (col. 4, lines 1-45.) The materials are contained in a housing and are electrically connected through the inter medium (col. 4, lines 30-60.) The housing has oxidant passages for electrode reactivity (figures.)

The reference does not teach a fuel electrode assembly surrounded by the ion-exchange membrane in a state being in contact with the ion exchange membrane and the ion-exchange membrane surrounded by the oxygen electrode in a state being in contact with the oxygen electrode. Bass et al. (US 6,001,500), however, teaches an electrochemical device comprising a fuel electrode which becomes a negative electrode while accompanying the generation of hydrogen; an oxygen electrode provided in contact with oxygen which becomes a positive

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electrode while accompanying generation of water from oxygen molecules, the hydrogen ions, and electrons; an ion-exchange membrane for conducting the hydrogen ions in the fuel electrode into the oxygen electrode, the ion-exchange membrane having a proton conductor; and a fuel source for supplying a fuel so as to generate the hydrogen ions in the fuel electrode. The fuel electrode assembly surrounded by the ion-exchange membrane in a state being in contact with the ion exchange membrane and the ion-exchange membrane surrounded by the oxygen electrode in a state being in contact with the oxygen electrode. It would be obvious to one of ordinary skill in the art at the time the invention was made to use an electrode structure with the anode on the inner surface of the cylinder and the cathode on the outer surface of the cylinder as taught in Bass as this configuration will allow for an equivalent means of providing electrical current from the fuel cell. As the anode requires the fuel source, one of ordinary skill in the art would be motivated to include the fuel source on the inner surface of the fuel cell in order to react the fuel at the anode. The order of the anode and electrode would provide the equivalent fuel cell and one of ordinary skill in the art would recognize that the order of the electrodes would be coupled with the electrodes appropriate reactant.

With regard to claim 5, the reference does not teach the fuel source formed into a round column. As noted in the rejection, it would be obvious to one of ordinary skill in the art at the time the invention was made to use an electrode structure with the anode on the inner surface of the cylinder and the cathode on the outer surface of the cylinder as taught in Bass. As the anode requires the fuel source, one of ordinary skill in the art would be motivated to include the fuel source on the inner surface of the fuel cell in order to react the fuel at the anode. In both

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references, the shape of the inner surface is cylindrical and therefore the shape of the fuel source on the interior would be a round column shape.

With regard to claims 7 and 8, MPEP 2113 states, "Even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process." The material includes carbon chains in the membrane.

### ***Response to Arguments***

Applicant's arguments filed 6/13/2005 have been fully considered but they are not persuasive. The applicant argues that the independent claims have been amended to recite that the ion exchange membrane includes a polymer and further comprises a carbon cluster derivative including a plurality of functional groups capable of transferring a plurality of protons between each of the functional groups of the carbon cluster derivative. The applicant argues that the cited references do not teach this limitation in the inventions of the prior art.

The examiner disagrees with the applicant's argument. Kelley et al. (US 6,080,501) teaches an electrochemical device that includes a Nafion membrane. This membrane reads upon the membrane as amended as it includes a polymer and a carbon cluster derivative including a plurality of functional groups that transfer protons between each of the functional groups of the carbon cluster derivative. The carbon backbone of the polymer is a carbon cluster and sulfone groups are disclosed in the figure. Carbon clusters are discussed on page 34 of the instant



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specification as "an aggregate in which carbon atoms of several to several hundreds are bonded to each other irrespective of the type of carbon-carbon bonding." Sulfone groups are disclosed on page 35. The term derivative broadens this definition. The Nafion structure reads upon the added limitations of the amended claims. Thus, the claims are rejected as presented.

***Examiner Correspondence***

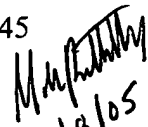
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mark Ruthkosky whose telephone number is 571-272-1291. The examiner can normally be reached on FLEX schedule (generally, Monday-Thursday from 9:00-6:30.) If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached at 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free.)

Mark Ruthkosky

Primary Patent Examiner

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8/8/05